



# NIH BACKGROUNDER

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National Institutes of Health

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## National Technology Centers for Networks and Pathways

As part of the NIH Roadmap for Medical Research, more than \$7 million will be awarded to establish two National Technology Centers for Networks and Pathways. The primary goal of these centers will be to develop new technologies to study the dynamics of molecular interactions within cells. The awards will be administered by the National Center for Research Resources, an NIH component that supports primary research to create and develop critical resources, models, and technologies.

### Developing Technology to Study the Dynamics of Protein Informatics

Scientists today can use existing technologies to inventory cellular proteins and their interactions with other proteins and molecules. But current technologies are insufficient for studying the complex dynamics of these interactions. Understanding these dynamics will shed light on the normal functions of molecular systems within cells and their abnormal functions in disease. To address this gap in technology, the new National Technology Centers for Networks and Pathways will develop highly sensitive tools to measure quantities, activities, translocations, and interactions of molecules at the very short timescales that occur in cellular processes. Each center has a thematic focus and will be supporting a set of biological projects for testing the newly developed technologies.

“These tools will give us a completely new way of looking at complex biological processes, allowing us to actually watch them in action,” said NIH Director Elias A. Zerhouni, M.D. “As the centers refine the technologies, these valuable resources will be made available to hundreds of investigators across the country who are working in every disease area.”

### Unraveling the Role of a Ubiquitous Cellular Process

At the **Burnham Institute** in La Jolla, California, the **Center on Proteolytic Pathways**, headed by Dr. Jeffrey Smith, will focus on proteolysis, or the breakdown of proteins within the cell. Proteolysis helps to regulate four aspects of cell behavior: division, differentiation (the process of cellular specialization during development), movement, and death. Proteolysis plays a key role in virtually every type of human disease, including cancer, emphysema, and Alzheimer’s disease. This center will study proteases (enzymes that catalyze proteolysis), their products, and the molecules that regulate their activity. The center also will train scientists on the use of new technologies for studying protease biology, and engage in outreach projects to disseminate the results of their research and establish connections within the scientific community.

## **Understanding the Implications of a Dynamic Protein Modification**

At **The Johns Hopkins University** in Baltimore, the new center on **Networks and Pathways of Lysine Modification**, headed by Dr. Jef Boeke, will focus on the addition of various chemical groups to the amino acid lysine within cellular proteins. These modifications trigger different cellular processes—for example, lysine modifications on certain chromosomal proteins are critical for controlling gene expression. Lysine modification also can control the life and death of most proteins, as well as many other protein functions. The center will develop new instrumentation systems for profiling lysine modification in single cells, which will be used to study changes that occur in cells as they develop, age, or become carcinogenic. The center also will have training and technology dissemination components. The technologies developed in this center will have implications for characterization of a broad range of other protein modifications.

## **Leveraging the New Technologies**

The two National Technology Centers for Networks and Pathways will receive initial funding for five years which may be renewed for an additional five years. Next fall, the NIH plans to fund several more Technology Centers. Application information is available at <http://grants.nih.gov/grants/guide/rfa-files/RFA-RM-04-019.html>. Also, a Program Announcement is being planned to solicit investigator-initiated projects that would focus on specific biomedical research problems to leverage the new technologies, and strengthen interaction between the centers and the research community.